



Ion-induced nucleation of the sulfuric acid – water system

Pedersen, Jens Olaf Pepke

Published in:
Geophysical Research Abstracts

Publication date:
2012

Document Version
Publisher's PDF, also known as Version of record

[Link back to DTU Orbit](#)

Citation (APA):
Pedersen, J. O. P. (2012). Ion-induced nucleation of the sulfuric acid – water system. *Geophysical Research Abstracts*, 14, EGU2012-8271.

General rights

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.



Ion-induced nucleation of the sulfuric acid – water system

J. O. Pepke Pedersen

Technical University of Denmark, National Space Institute, Copenhagen, Denmark (jopp@space.dtu.dk)

Ions can enhance nucleation under atmospheric conditions as shown by theory, observations, and experiments, but the exact mechanism still remains to be determined. In particular nucleation of the dipolar sulfuric acid – water system has been investigated since ion-induced nucleation is expected to increase the nucleation rate at the critical cluster size, where the charge makes the small clusters more thermodynamically stable than their neutral counterparts and thus reduces the energy barrier to nucleation.

Also the initial growth rates of small ion clusters are found to be enhanced by the dipole-charge interaction between the core ion and the strongly dipolar condensing sulfuric acid and/or water molecules. In the initial phase these ion-molecule interactions greatly accelerate the kinetics of molecular association. During the later stages of aerosol growth (from 2-3 nm and larger) the effect of the ion is expected to become small and the growth rate will be dominated by the vapor pressure of the condensing species.

We have studied ion-induced nucleation of the sulfuric acid – water system under a variety of conditions from an ultra-low background radiation environment 1100 meter underground to ionization densities far above the natural levels found in the atmosphere using a particle accelerator. Together with recent advances in modeling this has increased our understanding of the nucleation mechanism and the role of ions.